

[13] Electroplated wheel profile design system (Diamond tool and gear threaded grinding wheel)

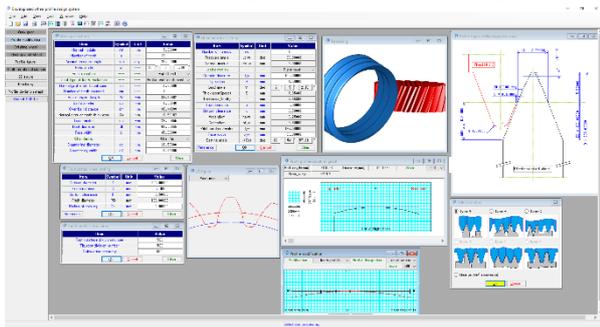


Fig. 13.1 Electroplated wheel profile design system

13.1 Abstract

This software can generate tooth form of diamond tool for dressing threaded grinding wheel. When grinding a gear with tooth surface modification, the modification amount of the diamond tool is not the same as the gear. However, in this software, tool shapes corresponding to tooth shape modification are generated as described in 13.4. Figure 13.1 shows the entire screen.

13.2 Gear to apply

- (1) Type of gear : cylindrical gear (external gear)
- (2) Tooth profile : involute

13.3 Gear specifications setting

Set gear specifications in Figure 13.2. The profile shift factor can also be entered from the tooth thickness or the over ball dimension.

Item	Symbol	Unit	Value
Normal module	mn	mm	5.00000
Number of teeth	z	---	22
Normal pressure angle	α_n	deg	20.00000
Helix angle	β	---	20 ° 0 ' 0.00 "
Helix direction	---	---	Right hand
Input type of tooth thickness	---	---	Profile shift coefficient
Normal profile shift coefficient	xn	---	0.20000
Number of teeth spanned	zm	---	3
Base tangent length	W	mm	38.42492
Ball diameter	dp	mm	8.55246
Over ball distance	dm	mm	130.44699
Normal circular tooth thickness	Sn	mm	8.58192
Tip diameter	da	mm	129.05955
Root diameter	df	mm	108.55955
Face width	b	mm	45.00000
Chamfering	---	---	Chamfer
Chamfering diameter	dc	mm	128.56000
Chamfering width	c2	mm	0.25000

Fig. 13.2 Gear specification (input)

13.4 Tooth profile modification

Tooth profile modification can be set up to 50 divisions in the tooth profile direction as shown in Fig. 13.3, and the numerical value on the right side of the screen can be set arbitrarily.

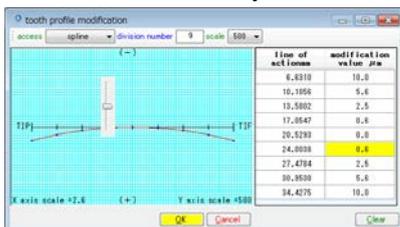


Fig. 13.3 Tooth profile modification

There were two kinds of tooth profile modification in the old version, but this time, 5 kinds are arranged as shown in Fig. 13.4. In this example, an example of type 3 is shown.

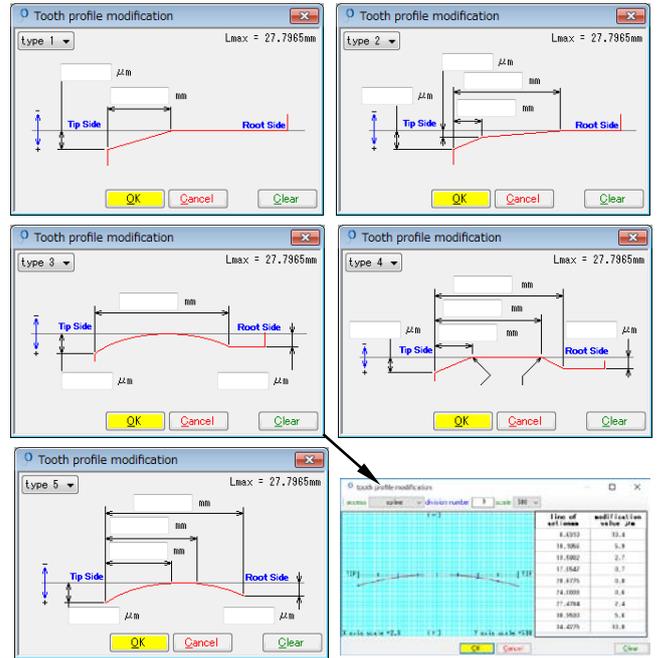


Fig. 13.4 Tooth profile modification

13.5 Setting of threaded grinding wheel

Fig. 13.5 shows the specification data setting screen of the threaded grinding wheel for grinding the gear (Fig. 13.2). The gear, threaded grindstone and mounting angle are "Lead angle", and the mounting angle of the threaded grinding wheel and electrodeposition grindstone is "Setting angle".

Item	Symbol	Unit	Value
Number of threads	zw	---	1
Pressure angle	α_w	deg	20.00000
Normal module	mn_w	mm	5.00000
Lead direction	---	---	Right hand
Outside diameter	D_w	mm	150.00000
Tip radius	R	mm	1.50000
Lead angle	γ	deg	2 ° 5 ' 2.19 "
Thickness(Space)	S	mm	7.85398
Thickness(Tooth)	T	mm	7.85398
Top clearance	u	mm	0.00000
Bottom clearance	k	mm	0.50000
Addendum	ha_w	mm	6.25000
Dedendum	hf_w	mm	5.50000
Pitch circle diameter	d_w	mm	137.50000
Face width	b_w	mm	50.00000
Setting angle	β_{Set}	deg	-17 ° 54 ' 57.81 "

Fig. 13.5 Setting of threaded grinding wheel specification

13.6 Setting of electrodeposition wheel (diamond tool)

Figure 13.6 shows the specification setting screen of the electrodeposition grinding wheel (diamond tool) dressing the threaded grinding wheel in Figure 13.5, and Figure 13.7 shows the size of the electrodeposition grinding wheel.

After setting the gear, threaded grinding wheel and electrodeposition wheel specifications, set the tooth profile calculation condition (division number) in Figure 13.8 and proceed with the calculation.

Item	Symbol	Unit	Value
Outside diameter	D	mm	200.00000
Side clearance	C	mm	0.10000
Bottom clearance	P	mm	0.50000
Base diameter	BD	mm	189.00000
Radius of crowing	Cr	mm	0.00000

Fig. 13.6 Electrodeposition grinding wheel

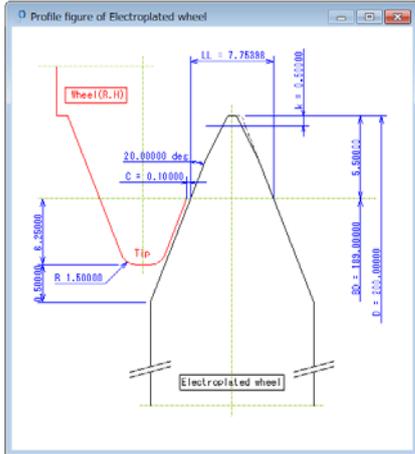


Fig. 13.7 Dimensions of electrodeposition grinding wheel

Item	Value
Tooth surface division number	500
Tip, root division number	500
Calculation accuracy	1000

図 13.8 齒形計算設定

13.7 Tooth profile

Fig. 13.9 to Fig. 13.12 show the gear tooth profile, the tooth profile after grinding, and the threaded grinding tooth profile and the electrodeposited tooth profile. And, Figures 13.13 and 13.14 show tooth profile rendering.

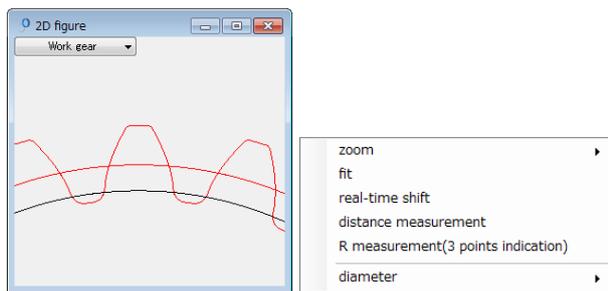


Fig. 13.9 Tooth profile

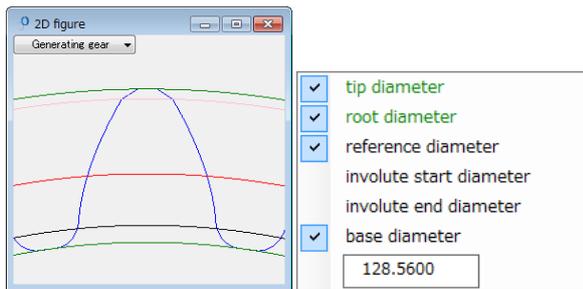


図 13.10 Tooth profile after tooth grinding

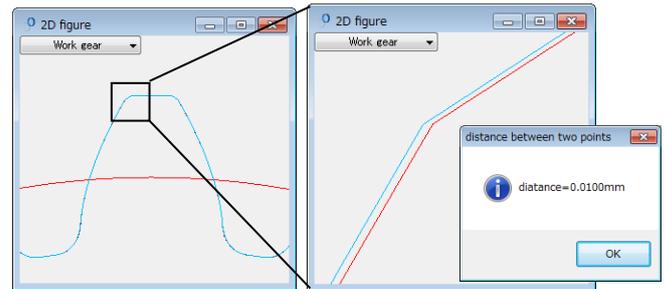


Fig. 13.11 Measurement of theoretical tooth profile and grinding tooth profile

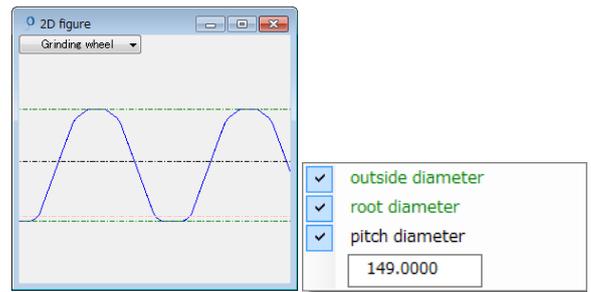


Fig. 13.11 Tooth profile of threaded grinding wheel

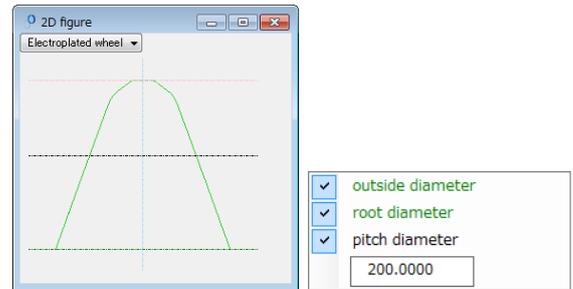


Fig. 13.12 Electrodeposited tooth profile

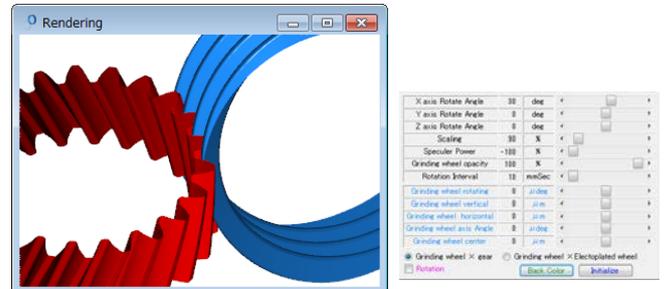


Fig. 13.13 Tooth profile rendering (gear and threaded grinding stone)

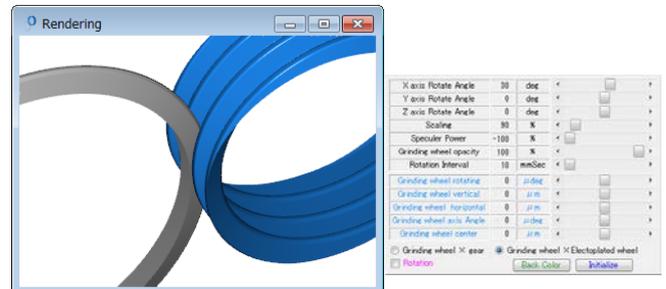


Fig. 13.14 Tooth profile rendering (diamond tool)

13.8 Tooth profile graph

In order to obtain the tooth profile modification of the gear given in Figure 13.3, the tooth profile of the threaded grinding wheel is generated. Next, Figure 13.15 shows the tooth profile of the gear as a tooth profile when the creation movement is made with a threaded grinding wheel.

The slider bar in Figure 13.15 shows that the length of the line of action is 32.098 mm and the tooth profile modification is 7.1 μm. Since the chamfer is given, the tooth tip of the graph is escaping greatly at the tip of the tooth.

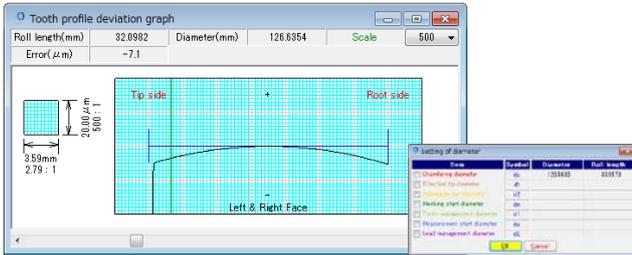


Fig. 13.15 Tooth profile graph

13.9 Electroplated grinding wheel (diamond tool) DXF file output

Figure 13.16 shows the shape selection screen of the electrodeposition wheel. When outputting the diamond tool shape as a DXF file, the shape selected depends on the specifications of the threaded whetstone set in Figure 13.5. Here, Figure 13.17 shows an example of outputting the diamond tool shape of the tool shape at the upper left of Figure 13.16.

Approximating the coordinate points of the three locations of the electrodeposition wheel abrasive tooth by R, we see that $R = 970.4$ mm as shown in Fig. 13.18. However, the size of R varies depending on the indicated position. In addition, as shown in Fig. 13.19, it is possible to output the front tooth profile of the gear (including tooth profile modification).

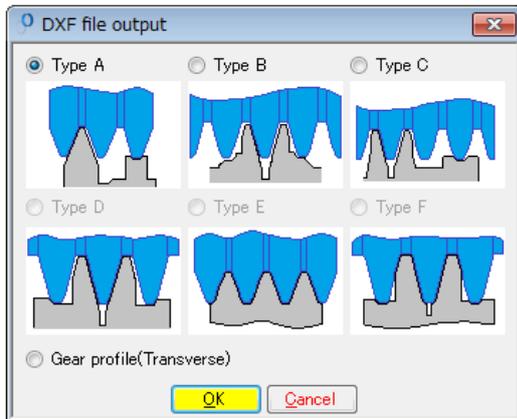


Fig. 13.16 Select shape of diamond tool

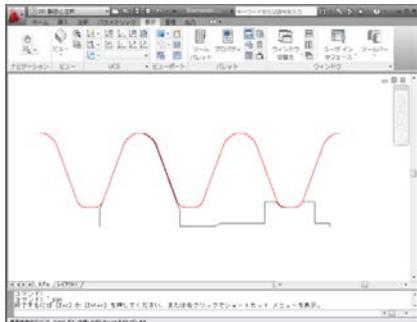


Fig. 13.17 CAD drawing example (diamond tool)

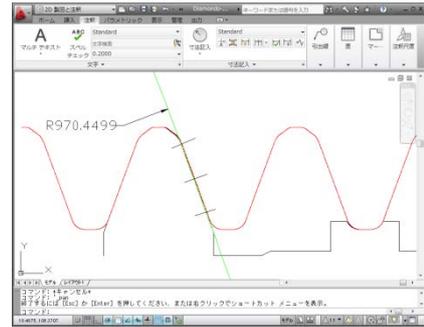


Fig. 13.18 Profile of diamond tool

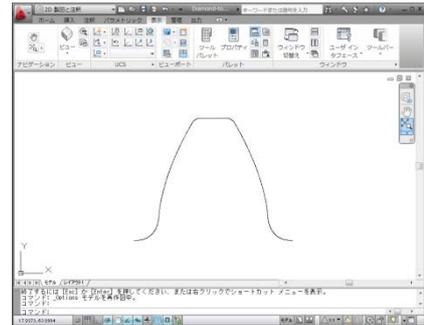


Fig. 13.19 CAD drawing example (diamond tool)

13.10 HELP function

The operation explanation of this software has the HELP function as shown in figure 13.20. If you do not understand an unknown item or operation at the time of input, press the [F1] key with the screen active and display the explanation screen as shown in Figure 13.21. And Figure 20 outlines HELP.

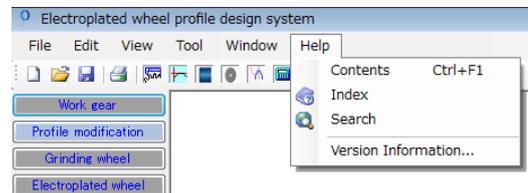


Fig. 13.20 HELP function

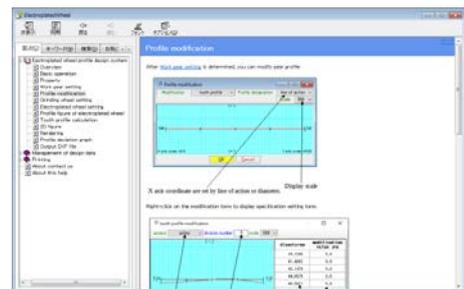


Fig. 13.21 Explanation of the profile-modification

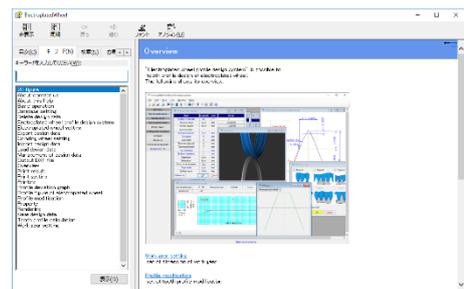


Fig. 13.22 HELP function (overview)